CLAIMS

What is claimed is:

1. A method for on-wafer burn-in of a semiconductor device on a wafer, the semiconductor device having a normal operating current and a normal operating temperature, the method comprising the steps of:

(a) applying a scan current to the semiconductor device under a predetermined ambient temperature;

(b) registering performance characteristics of the semiconductor device during the application of the scan current thereto; and

(c) determining whether the semiconductor device is prone to infant mortality based on the performance characteristics registered in said step (b);

wherein the scan current is higher than the normal operating current of the semiconductor device and the predetermined ambient temperature is higher than the normal operating temperature of the semiconductor device, and wherein the performance of the semiconductor device is stabilized by the application of the scan current.

2. The method as recited in Claim 1, wherein the semiconductor device is a vertical cavity surface emitting laser (VCSEL) device.

3. The method as recited in Claim 1, wherein said steps (a) and (b) are repeated for a predetermined number of times and wherein said determination in said step (c) is based on a comparison of the performance characteristics of the semiconductor device registered in said repetitions of said step (b).

4. The method as recited in Claim 1, wherein the wafer comprises a plurality of said semiconductor device and wherein said steps (a), (b) and (c) are repeated for each of said plurality of said semiconductor device on the wafer.

5. The method as recited in Claim 4, wherein said steps (a) and (b) are performed on said plurality of said semiconductor device one at a time in serial fashion.

6. The method as recited in Claim 4, wherein said steps (a) and (b) are performed on a subset of said plurality of said semiconductor device simultaneously, and wherein said

subset includes more than one but not all of said plurality of said semiconductor device on the wafer.

7. The method as recited in Claim 1, wherein the scan current is applied to the semiconductor device for as long as 20 milliseconds (ms).

8. The method as recited in Claim 1, wherein the scan current is substantially higher than 20 milliamperes (mA).

9. The method as recited in Claim 1, wherein the scan current is as high as 50 milliamperes (mA).

10. The method as recited in Claim 1, wherein the scan current is applied using a current sweeping mode.

11. The method as recited in Claim 1, wherein the scan current is applied using a current pulsing mode.

12. The method as recited in Claim 1, wherein the scan current is applied via an auto-prober.

13. A semiconductor processing apparatus comprising:

a current source;

a microprobe coupled to the current source, the microprobe configured to apply a scan current to a semiconductor device on a wafer under a predetermined ambient temperature, the microprobe also configured to capture data concerning performance characteristics of the semiconductor device during the application of the scan current thereto, wherein the scan current is higher than the normal operating current of the semiconductor devices and the predetermined ambient temperature is higher than the normal operating temperature of the semiconductor devices; and

a processing module coupled to the microprobe, the processing module configured to receive the data captured by the microprobe and to determine whether the semiconductor device is prone to infant mortality based on the data.

14. The apparatus as recited in Claim 13, wherein the semiconductor device is a vertical cavity surface emitting laser (VCSEL) device.

15. The apparatus as recited in Claim 13, wherein the microprobe is further configured to repeatedly apply the scan current to the semiconductor device and capture the data concerning performance characteristics of the semiconductor device during each application of the scan current for a predetermined number of times, and wherein the processing module is configured to determine whether the semiconductor device is prone to infant mortality based on a comparison of the data received for said repeated applications of the scan current.

16. The apparatus as recited in Claim 13, which is configured to process a plurality of said semiconductor device on the wafer.

17. The apparatus as recited in Claim 16, which is further configured to process said plurality of said semiconductor device one at a time in serial fashion.

18. The apparatus as recited in Claim 16, which is further configured to process a subset of said plurality of said semiconductor device simultaneously, wherein said subset includes more than one but not all of said plurality of said semiconductor device on the wafer.

19. The apparatus as recited in Claim 13, wherein the microprobe is further configured to apply the scan current to the semiconductor device for as long as 20 milliseconds (ms).

20. The apparatus as recited in Claim 13, wherein the microprobe is further configured to apply the scan current of substantially higher than 20 milliamperes (mA) to the semiconductor device.

21. The apparatus as recited in Claim 13, wherein the microprobe is further configured to apply the scan current of as high as 50 milliamperes (mA) to the semiconductor device.

22. The apparatus as recited in Claim 13, wherein the microprobe is further configured to apply the scan current to the semiconductor device using a current sweeping mode.

23. The apparatus as recited in Claim 13, wherein the microprobe is further configured to apply the scan current to the semiconductor device using a current pulsing mode.

24. A system for burning-in semiconductor devices, comprising:

a processor; and

a mechanical module coupled to and controlled by the processor, wherein the mechanical module is configured to (1) apply a scan current to the semiconductor devices on a wafer; (2) capture data concerning performance characteristics of the semiconductor devices during the application of the scan current thereto, wherein the scan current is higher than the normal operating current of the semiconductor devices; and wherein the processor is configured to receive the data captured by the mechanical module for determining whether the semiconductor device is prone to infant mortality.

25. The system as recited in Claim 24, which is configured to process vertical cavity surface emitting laser (VCSEL) devices.

26. The system as recited in Claim 24, wherein the mechanical module is further configured to repeatedly apply the scan current to the semiconductor devices and capture the data concerning performance characteristics of the semiconductor devices during each application of the scan current for a predetermined number of times, and wherein the processor is further configured to determine whether the semiconductor device is prone to infant mortality based on a comparison of the data received for said repeated applications of the scan current.

27. The system as recited in Claim 24, which is configured to process the semiconductor devices one at a time in serial fashion.

28. The system as recited in Claim 24, which is configured to process a subset of the semiconductor devices simultaneously, wherein said subset includes more than one but not all of the semiconductor devices on the wafer.

29. The system as recited in Claim 24, wherein the mechanical module is further configured to apply the scan current to the semiconductor devices for as long as 20 milliseconds (ms).

30. The system as recited in Claim 24, wherein the mechanical module is further configured to apply the scan current of as high as 50 milliamperes (mA) to the semiconductor devices.

31. The system as recited in Claim 24, wherein the mechanical module is further configured to apply the scan current to the semiconductor devices in a current sweeping mode.

32. The system as recited in Claim 24, wherein the mechanical module is further configured to apply the scan current to the semiconductor devices in a current pulsing mode.

33. A method for stabilizing the performance of a semiconductor device on a wafer, the semiconductor device having a normal operating current and a normal operating temperature, the method comprising the step (a) of:

repeatedly applying a scan current to the semiconductor device under a predetermined ambient temperature, wherein the scan current is higher than the normal operating current of the semiconductor device and the predetermined ambient temperature is higher than the normal operating temperature of the semiconductor device, until the performance of the semiconductor device is stabilized.

34. The method as recited in Claim 33, wherein the semiconductor device is a vertical cavity surface emitting laser (VCSEL) device.

35. The method as recited in Claim 33, wherein the wafer comprises a plurality of said semiconductor device and wherein said step (a) is performed on each of said plurality of said semiconductor device on the wafer.

36. The method as recited in Claim 35, wherein said step (a) is performed on said plurality of said semiconductor device one at a time in serial fashion.

37. The method as recited in Claim 35, wherein said step (a) is performed on a subset of said plurality of said semiconductor device simultaneously, and wherein said subset includes more than one but not all of said plurality of said semiconductor device on the wafer.

38. The method as recited in Claim 33, wherein the scan current is applied to the semiconductor device for as long as 20 milliseconds (ms).

39. The method as recited in Claim 33, wherein the scan current is substantially higher than 20 milliamperes (mA).

40. The method as recited in Claim 33, wherein the scan current is applied using a current sweeping mode.

41. The method as recited in Claim 33, wherein the scan current is applied using a current pulsing mode.

42. The method as recited in Claim 33, wherein the scan current is applied via an auto-prober.